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Environmental Management Division
Environmental Control Services

Environmental Control Programs

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Source Testing for Particulate Emissions From the East Retort Stack at Garry Memorial Crematorium Winnipeg, Manitoba 1985

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Workplace Safety and Health.

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ABSTRACT

During July 1985 three particulate source emission tests were conducted on the east pathological crematory at Garry Memorial Crematorium Ltd., Winnipeg, Manitoba. During the testing program the average particulate concentration, at mean stack CO_2 values was 0.14 grams per dry standard* cubic metre (g/dscm). When mean stack CO_2 values were corrected to 12%, the average particulate concentration increased to 0.22 g/dscm. The particulate test results are in general compliance with Manitoba Regulation 334/74, Clause 3(1) limiting particulate emissions from new incinerators to 0.23 g/dscm of dry flue gas when corrected to 12% CO_2.

* temperature 20°C, pressure 760 mm Hg

INTRODUCTION

In order to determine compliance with Manitoba Regulation 334/74, Clause 3(1), the Air Pollution Control Section conducted a stack sampling survey on the east (new) pathological crematory at Garry Memorial Crematorium Ltd., 1291 McGillivary Boulevard, Winnipeg, Manitoba in October, 1984. The results of these two emission tests revealed that the crematory was in non-compliance with Clause 3(1) of Regulation 334/74.

A follow-up survey was conducted in 1985 to determine if the crematory was then in compliance with the regulation. For the 1985 tests a new water cooled probe was used to avoid any of the metal fatigue problems normally associated with the intense heat in a crematory stack.

PROCESS DESCRIPTION

An all Crematory Corporation Model L-1701 dual chamber Crematory Retort (see Figure 1) is installed at Garry Memorial Crematorium. Drying, ignition and partial combustion of the Case (Corpse) occurs in the primary chamber. Air intake to the primary chamber is carefully controlled so that the rate of combustion and therefore the temperature is controlled. This prevents turbulent high velocity gases from developing which could transport ash particles into the secondary (afterburner) chamber. As a further precaution the flue gases exit downward into a settling chamber at the base of the afterburner so that any entrained ash particles are not emitted via the stack. Air to the secondary chamber is supplied in excess of stoichiometric requirements to ensure complete combustion.

The combustion products, mainly carbon dioxide and water vapor, exit through a 15 foot (4.6 m) steel stack with a 5 inch (12.7 cm) firebrick liner. The stack has an average inside diameter of 19.4 inches (49.2 cm).

A special start up sequence is utilized for the first cremation each day. The combustion blower is started first to purge the system 3 1/2 minutes prior to ignition of the afterburner. For the next 20 minutes the combustion blower and after burner are run continuously to preheat the secondary chamber. When the preheat cycle is completed a casket is inserted into the retort. After the door is fully closed the main burner is ignited. During the 2 hour cremation

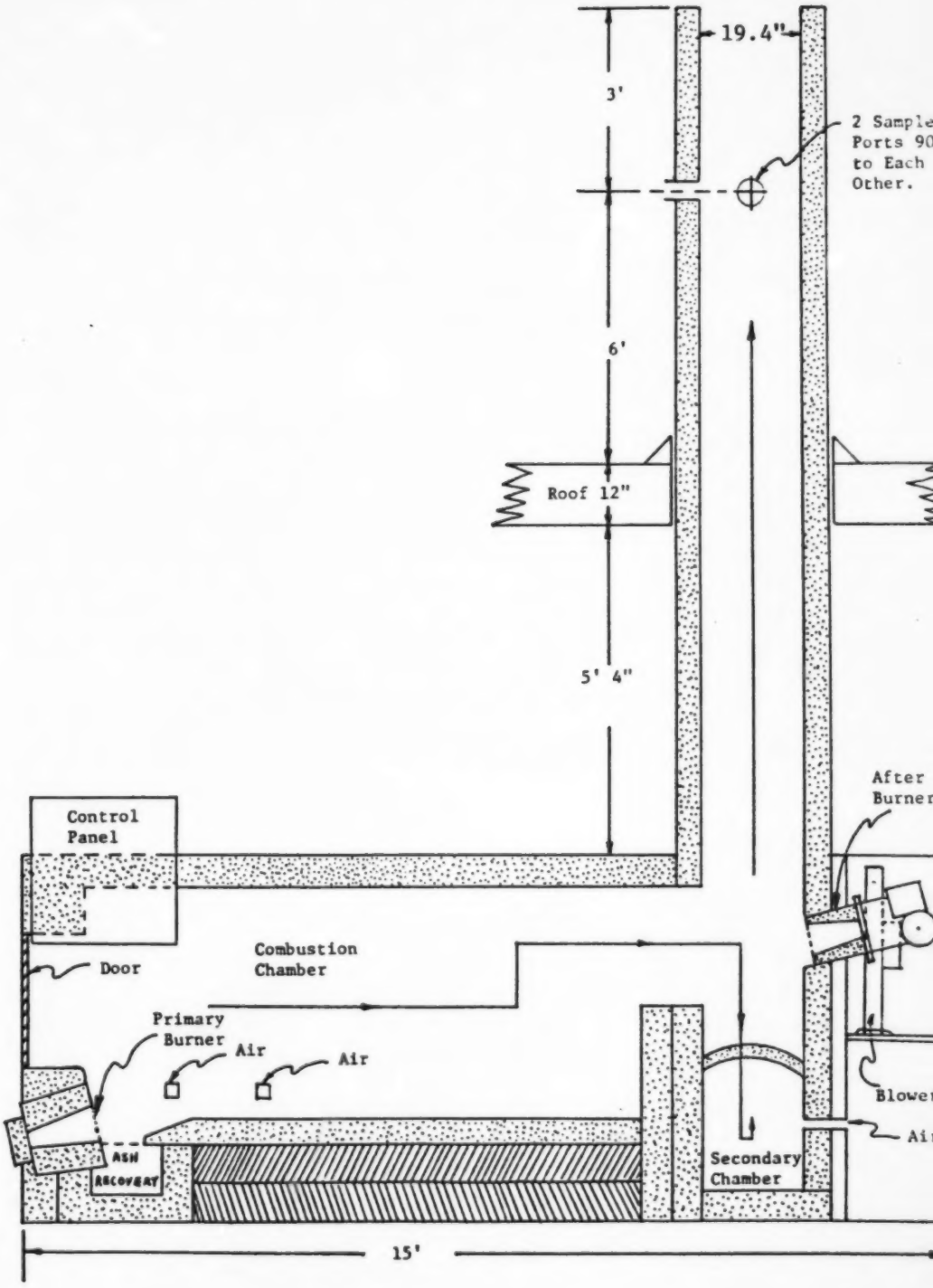


FIGURE 1: All Crematory Corp. Model L-1701 Retort as Installed at Garry Memorial Crematorium.

cycle a fuel saver device will automatically set the main burner in the low fire position whenever the temperature exceeds 1600°F (871°C). At the end of the 2 hour cycle a timer automatically turns off the retort burners. At this point a visual inspection of the Case is made -- if the cremation is complete the combustion blower alone is turned on for 1 1/4 hours to cool the retort down on the cooling cycle. If not the combustion blower is started, followed 3 1/2 minutes later by the afterburner and the main burner which are fired untill the cremation is complete. After the cooling cycle is finished the cremains are removed.

When a second cremation is scheduled the same day the next preheat cycle is approximately five minutes or 800°F (427°C) on the temperature indicator. This cremation cycle remains the same as the first, however the cool down cycle is increased to 2 1/4 hours.

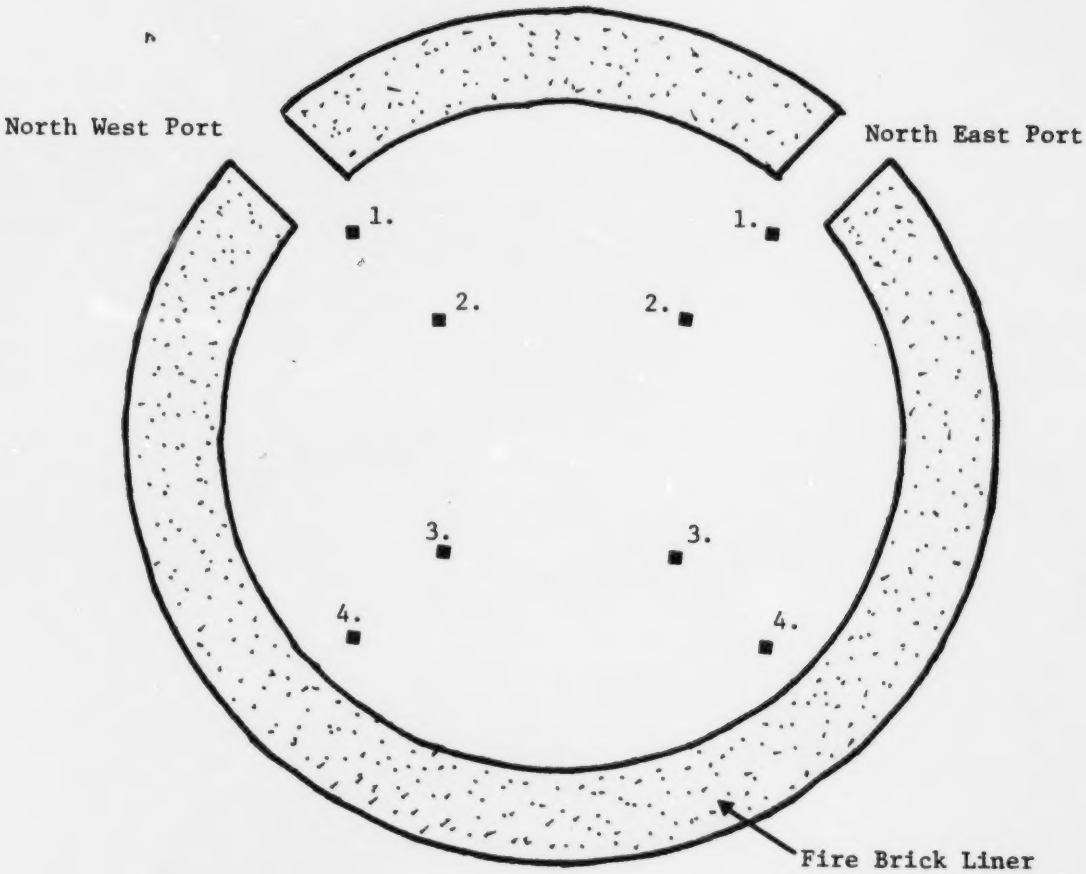
PROCESS SCHEDULE

During the sampling program one Case was cremated per test. The first casket (Test 1) was wooden while the second and third (Tests 2 and 3) were cardboard.

TEST PROCEDURES

All sampling was conducted through two ports located at right angles to each other (northwest and northeast) 12.5 feet (3.8 m) above the secondary chamber and 3 feet (0.9 m) below the top of the stack. This corresponds to 7.7 and 1.9 duct diameters respectively of unrestricted flow before and after the sampling location. Four points were sampled along each traverse according to Environmental Protection Service (EPS) Method A specifications. The sample points, located 1.3, 4.8, 14.5 and 18.1 inches (3.3, 12.2, 36.8 and 46.0 cm) respectively from the stack wall are depicted on a cross section of the stack in Figure 2. Sampling intervals were five minutes per point.

Source emission testing was conducted according to EPS Method E, with one exception. To eliminate metal fatigue caused by the high stack gas temperature, the probe was water cooled rather than electrically heated. Figure 3 illustrates the particulate stack sampling train. The sample was drawn into a 0.497 in. (12.62 mm) nozzle, through a stainless steel probe and into a miniature cyclone which removed particulate matter of greater than 10μ diameter. The sample was then passed through a Whatman 934 AH glass microfiber filter (supported by a porous fritted glass disc) which removed particulates of 0.3μ diameter and greater. Both the cyclone and the filter were heated to prevent moisture from condensing at that point. The sample was then passed through four 500 ml Greenburg-Smith impingers connected in series in an ice bath. The first, third and



■ = Sample Point Location

FIGURE 2. Stack Cross Section Depicting Sample Points.

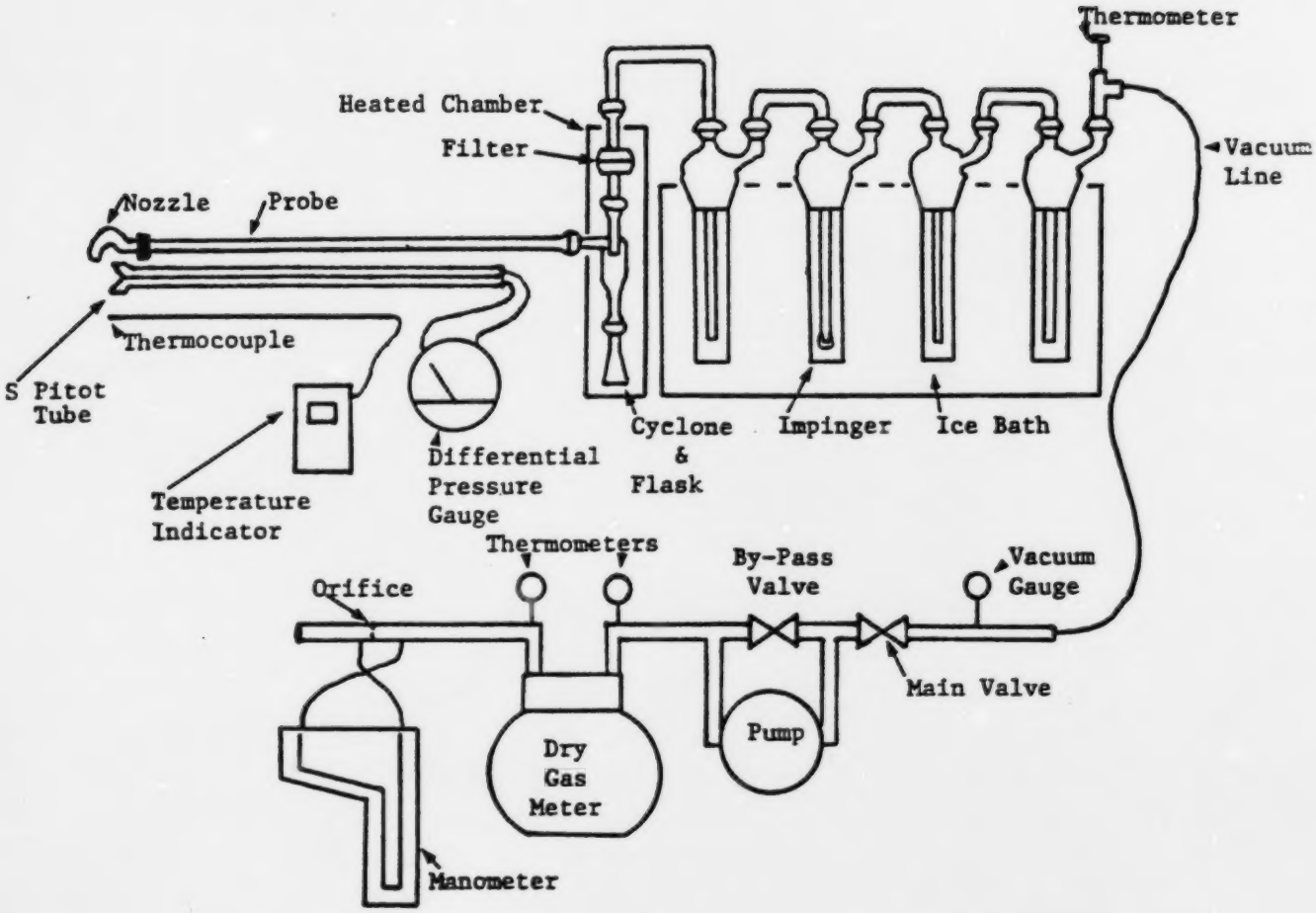


FIGURE 3. Particulate Stack Sampling Train

fourth impingers had modified straight tips while the second was of the standard design. The first and second impingers contained 100 ml of deionized water. The third impinger was initially empty while the fourth contained 200 grams of indicating silica gel to remove remaining moisture from the gas sample.

A Bendix Series 4500 Isokinetic Stack Sampler was used to extract the samples from the stack. Gas velocity in the stack was measured with an S type pitot tube and a Dwyer Magnehelic Differential Pressure Gauge (range 0 to 0.25" H_2O, minor division 0.005" H_2O). Dry gas meter and pitot tube calibration data sheets are located in Appendix A. A Hays-Republic Model 621A Gas Analyzer was used to determine CO_2, O_2 and CO content of the stack gas. Stack temperature was measured by a K type thermocouple.

After sample recovery from the stack train, samples were submitted to the W. M. Ward Technical Services Laboratory for gravimetric analysis of particulates. As the nozzle was not water cooled (and therefore subject to metal fatigue) the particulate matter extracted from it was not included in the sample submitted to the lab.

The sampling team consisted of Kevin Reeve and Tim Higham.

RESULTS

During the testing program the crematory retort was operated according to manufacturers instructions. Important sampling parameters are summarized in Table 1.

Source emission data are summarized in Table 2. Refer to Appendices B, C and D respectively for velocity profiles, field data sheets and the laboratory analytical reports.

TABLE 1: SUMMARY OF SAMPLING PARAMETERS

TEST NUMBER	1	2	3
SAMPLING DATE	July 9, 1985	July 10, 1985	July 10, 1985
SAMPLING DURATION, minutes	40	40	40
SAMPLE VOLUME @ METER CONDITIONS, ft^3	17.906	16.285	15.001
SAMPLE VOLUME @ STANDARD CONDITIONS*, dscm	0.4704	0.4306	0.3946
AVERAGE GAS METER TEMPERATURE, °F	93	88	91
ORIFICE PRESSURE DROP, in. H_2O	0.684	0.573	0.484
STACK STATIC PRESSURE, in. H_2O	+0.10	+0.10	+0.10
AVERAGE STACK GAS TEMPERATURE, °F	1361	1270	1310
AVERAGE STACK GAS VELOCITY, ft/s	19.6	18.1	16.9
ISOKINETIC FACTOR, %	107.8	98.7	98.0

*Standard Conditions are 20°C and 760 mm Hg

TABLE 2: SOURCE EMISSION SUMMARY

TEST NUMBER		1	2	3	AVERAGE
STACK GAS COMPOSITION DRY BASIS, % BY VOLUME	CO_2	8	8	8	-
	O_2	10.8	11.5	11.5	-
	CO	0	0	0	-
STACK GAS MOISTURE, % BY VOLUME		13.9	11.2	10.6	-
Ms**, g/g-mole		28.08	28.43	28.50	-
AVERAGE STACK GAS VOLUMETRIC FLOW RATE, dscm/h		999	999	918	972
CONCENTRATION OF PARTICULATE IN THE STACK GAS, g/dscm:	AT STACK CO_2	0.16	0.11	0.16	0.14
	AT 12% CO_2	0.24	0.17	0.24	0.22
EMISSION RATE OF PARTICULATE, kg/h		0.16	0.11	0.15	0.14

** Molecular Weight of the Stack Gas on a Wet Basis

DISCUSSION

The 1985 tests revealed a 15% reduction in average particulate emissions when compared to test results of the previous year. This could be due to the fact that the retort liner is now fully cured whereas in 1984 it may not have been.

CONCLUSION

The results of the three source emission tests indicate that during the survey the average particulate emission was 0.22 g/dscm when corrected to 12% CO_2 or 0.14 g/dscm at mean stack CO_2 values. When corrected to 12% CO_2 the particulate emission is below the Manitoba Regulation 334/74, Clause 3(1) limit of 0.23 g/dscm.

The average particulate emission rate was 0.14 kg/h.

SELECTED BIBLIOGRAPHY

1. Reeve, Kevin E. Source Testing For Particulate Emissions From The Incinerator At Cara Operations Ltd., Winnipeg, Manitoba. Wpg., Mb: Manitoba Department of Environment and Workplace Safety and Health, 1983.

2. Retort Operating Instructions Model L-1701. Cleveland, Ohio: All Crematory Corporation, n.d.

3. Standard Reference Methods For Source Testing: Measurement Of Emission Of Particulates From Stationary Sources. Ottawa, Ont: Environment Canada, Environmental Protection Service, 1974 (Report EPS 1-AP-74-1).

APPENDIX A

DRY GAS METER & ORIFICE METER CALIBRATION SHEET

Lab No. 16399 1/2

Dry Gas Meter S/N Bendix 711030

Atmospheric Pressure 28.70 in. Hg or 729.0 mm. Hg

Ambient Temperature 21.5°C

Calibrated re Large Wet Test Meter

Calibrated by Jim Prokopowich & Tim Higham

Date 21 June 85

Manometer Orifice ΔH (in. H_2O)	W.T.M. Volume Vw (Ft.^{3})	Dry Gas Meter Reading Initial (Ft.^{3})	Dry Gas Meter Reading Final (Ft.^{3})	D.G.M. Volume Vd (Ft.^{3})	Temperature W.T.M. Tw (°F.)	Temperature W.T.M. Tw (°C.)	Temperature D.G.M. Ti (°F.)	Temperature D.G.M. To (°F.)	Time t (Min.:Sec.)	Time t (Min.)	W.T.M. Manometer Δm (in. H_2O)	Partial Pressure Ps (mm. Hg)	W.T.M.:D.G.M. Ratio γ (—)	$\sqrt{\ }$ (—)	Flowrate S.C.T.P. Qm (Ft.^{3}/min.)
0.490	3.0	779.938	782.957	3.019	69.2	20.7	96	73	7:44.27	7.7378	0.33	18.310	0.9947	0.5603	0.3799
0.485	3.0	783.963	787.000	3.037	69.3	20.7	99	75	7:47.53	7.7922	0.40	18.310	0.9930	0.5585	0.3785
0.485	3.0	788.012	791.063	3.051	69.3	20.7	100	78	7:49.78	7.8297	0.40	18.310	0.9920	0.5601	0.3788
1.00	4.0	793.098	797.181	4.083	69.2	20.7	105	80	7:06.27	7.1045	0.53	18.310	0.9932	0.8052	0.5579
1.00	4.0	798.205	802.292	4.087	69.3	20.7	106	80	7:07.31	7.1218	0.40	18.310	0.9933	0.8052	0.5566
1.00	4.0	803.320	807.419	4.099	69.3	20.7	107	82	7:08.34	7.1390	0.39	18.310	0.9931	0.8066	0.5574
1.50	4.0	809.474	813.590	4.116	69.3	20.7	110	83	5:48.70	5.8117	0.53	18.310	0.9909	0.9882	0.6848
1.52	4.0	814.622	818.744	4.122	69.3	20.7	110	84	5:48.93	5.8155	0.57	18.310	0.9902	0.9957	0.6855
1.52	4.0	820.294	824.420	4.126	69.3	20.7	110	84	5:48.95	5.8158	0.55	18.310	0.9893	0.9957	0.6855
2.00	5.0	825.963	831.127	5.164	69.2	20.7	110	84	6:25.96	6.4327	0.51	18.310	0.9872	1.1414	0.7740
2.00	5.0	832.153	837.325	5.172	69.2	20.7	110	85	6:26.40	6.4400	0.59	18.310	0.9863	1.1425	0.7744
2.00	5.0	838.354	843.523	5.169	69.2	20.7	110	85	6:26.41	6.4402	0.46	18.310	0.9872	1.1425	0.7746

Linear Regression: Intercept (b) 0.0173

Slope (K) 0.6626

Coefficient of Determination (r^2) 0.9988

$\bar{\gamma}$ = 0.9886

ΔH@ = 2.0932

Comments:

#245 Rev. 9/29/83 JP/cm

DRY GAS METER & ORIFICE METER CALIBRATION SHEET Lab No. 16399 7/2

Dry Gas Meter S/N Bendix 711030

Atmospheric Pressure 28.70 in Hg or 729.0 mm. hg

Ambient Temperature 21.5 °C

Calibrated re Large Wet Test Meter

Calibrated by Jim Prokopovich & Jim Higham

Date 21 June 85

Manometer Orifice ΔH (in. H_2O)	W.T.M. Volume Vw (Ft.^{3})	Dry Gas Meter Reading Initial (Ft.^{3})	Dry Gas Meter Reading Final (Ft.^{3})	D.G.M. Volume Vd (Ft.^{3})	Temperature W.T.M. Tw (°F.)	Temperature W.T.M. Tw (°C.)	Temperature D.G.M. Ti (°F.)	Temperature D.G.M. To (°F.)	Time t (Min.:Sec.)	Time t (Min.)	W.T.M. Manometer Δm (in. H_2O)	Partial Pressure Ps (mm. Hg)	W.T.M.:D.G.M. Ratio γ (—)	$\sqrt{\ }$ (—)	Flowrate Q C.F.F. Qm (Ft.^{3}/min.)
.50	6.0	845.588	851.779	6.191	69.2	20.7	108	85	6:55.49	6.9248	0.77	18.310	0.9853	1.2765	0.8627
.60	6.0	852.815	859.006	6.191	69.2	20.7	108	85	6:50.88	6.8480	0.60	18.310	0.9855	1.3016	0.8725
.60	6.0	860.033	866.224	6.190	69.2	20.7	108	85	6:47.40	6.7900	0.60	18.310	0.9856	1.3016	0.8800
.04	6.0	868.284	874.463	6.179	69.1	20.6	104	85	6:19.55	6.3258	0.75	18.197	0.9827	1.4067	0.9434
.06	6.0	875.492	881.667	6.175	69.1	20.6	103	85	6:17.68	6.2947	0.81	18.197	0.9822	1.4112	0.9479
.10	6.0	882.700	888.873	6.173	69.1	20.6	103	85	6:15.13	6.2522	0.78	18.197	0.9825	1.4204	0.9543

Linear Regression: Intercept (b) 0.0173

Slope (K) 0.6626

Coefficient of Determination (r^2) 0.9988

$\bar{\gamma}$ = 0.9886 ± 0.0041

ΔH@ = 2.0932

Comments:

#245 Rev. 9/29/83 JF/cm

S-TYPE PITOT TUBE CALIBRATION

PROBE SIZE (ft) 5' SS Water Cooled CALIBRATION # 85 - 25

PROBE LINER SS DATE April 12, 1985

PROBE MANUFACTURER BENDIX

TIP SIZE (inches) 0.500

STACK THERMOCOUPLE ☒ PRESENT

☐ ABSENT

HP 97 INPUT/OUTPUT

Temp	21.3	°C
Bar. Press	29.36	In. Hg
Scale Factor	0.1	

1	0.10	Δ p (std)
Tunnel Velocity	6.727909	ft/sec
	0.17	Δ p (s-pitot)
Cp, at this	0.765048	velocity
Tunnel Velocity	6.729319	(using Cp)

2	0.22	Δ p (std)
	9.979101	
	0.36	Δ p (s-pitot)
	0.779782	
	9.981192	

3	0.29	Δ p (std)
	11.457215	
	0.48	Δ p (s-pitot)
	0.775338	
	11.459617	

4	0.39	Δ p (std)
	13.286555	
	0.65	Δ p (s-pitot)
	0.772660	
	13.289339	

5	0.51	Δ p (std)
	15.193757	
	0.83	Δ p (s-pitot)
	0.781914	
	15.196941	

6	0.69	Δ p (std)
	17.672770	
	1.11	Δ p (s-pitot)
	0.786459	
	17.676474	

7	0.84	Δ p (std)
	19.499332	
	1.35	Δ p (s-pitot)
	0.786839	
	19.503418	

8	1.24	Δ p (std)
	23.691411	
	1.96	Δp(s-pitot)
	0.793406	
	23.696376	

9	1.72	Δ p (std)
	27.902576	
	2.67	Δp(s-pitot)
	0.800611	
	27.908424	

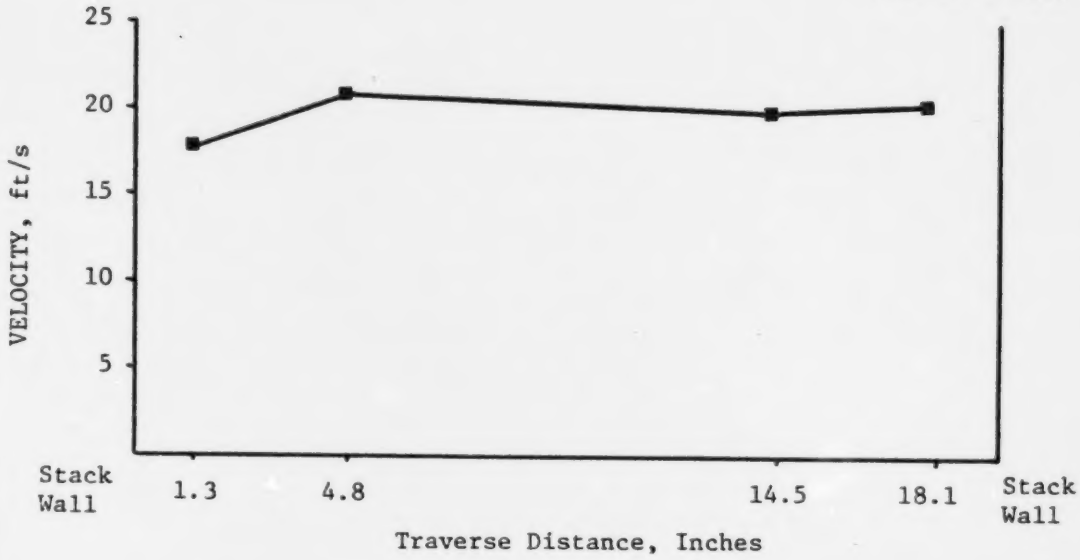
0.782451	Cp (ave)
0.010850	Std. Dev.
8	Deg. of Freedom

2.306	t .05
0.774110	Low Cp
0.782451	Mean Cp
0.790791	High Cp

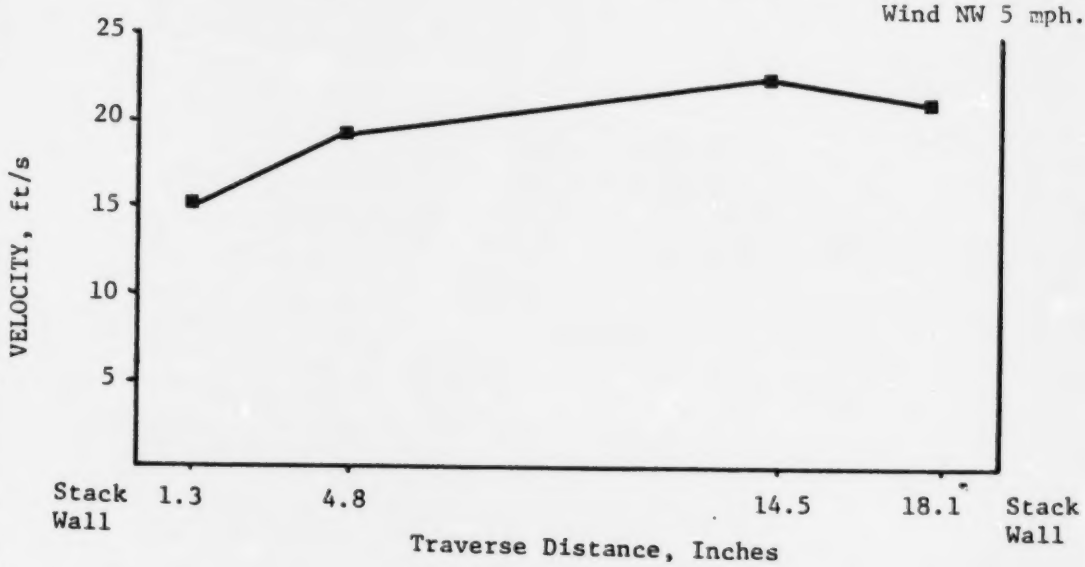
rev. 82-01

APPENDIX B

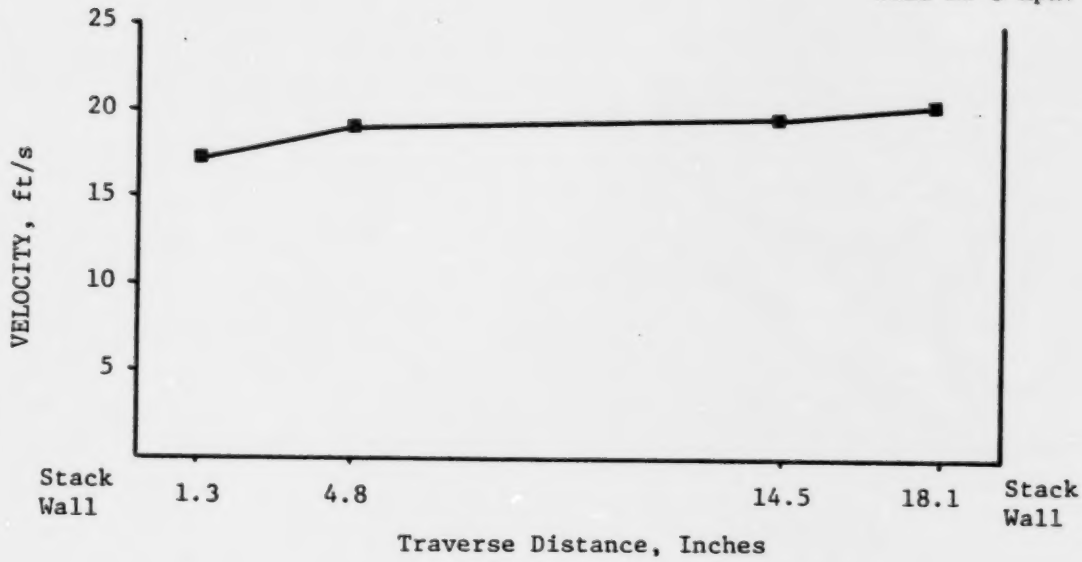
Graph 1. Velocity Profile of Test 1. Northwest Port.
Wind NW 5 mph.



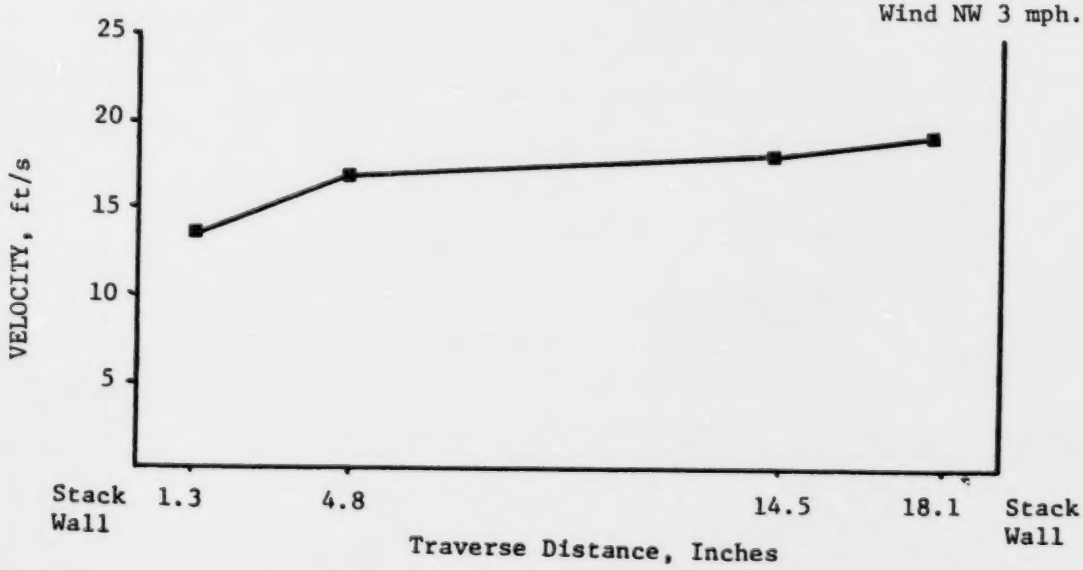
Graph 2. Velocity Profile of Test 1. Northeast Port.
Wind NW 5 mph.



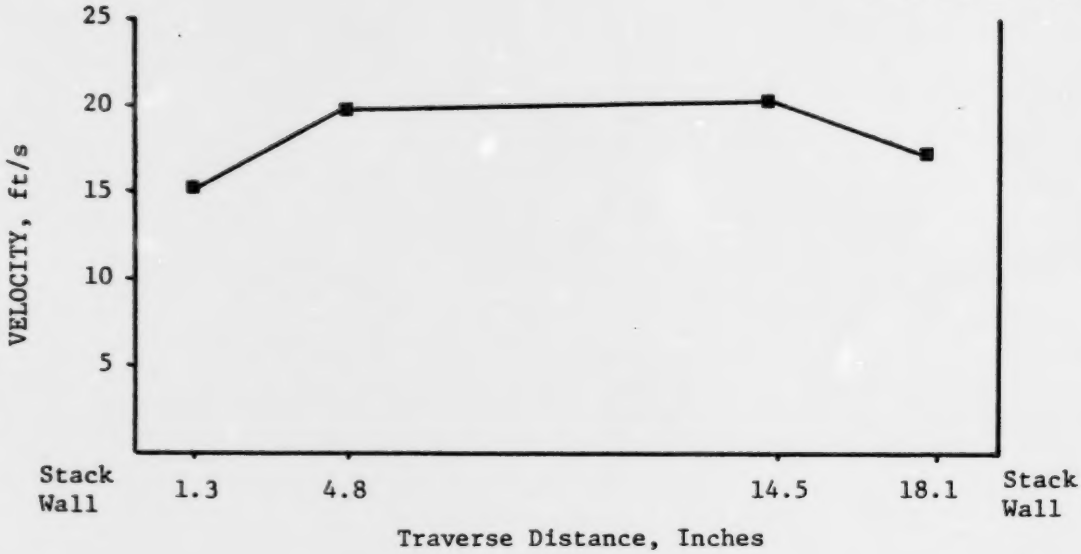
Graph 3. Velocity Profile of Test 2. Northwest Port.
Wind NW 3 mph.



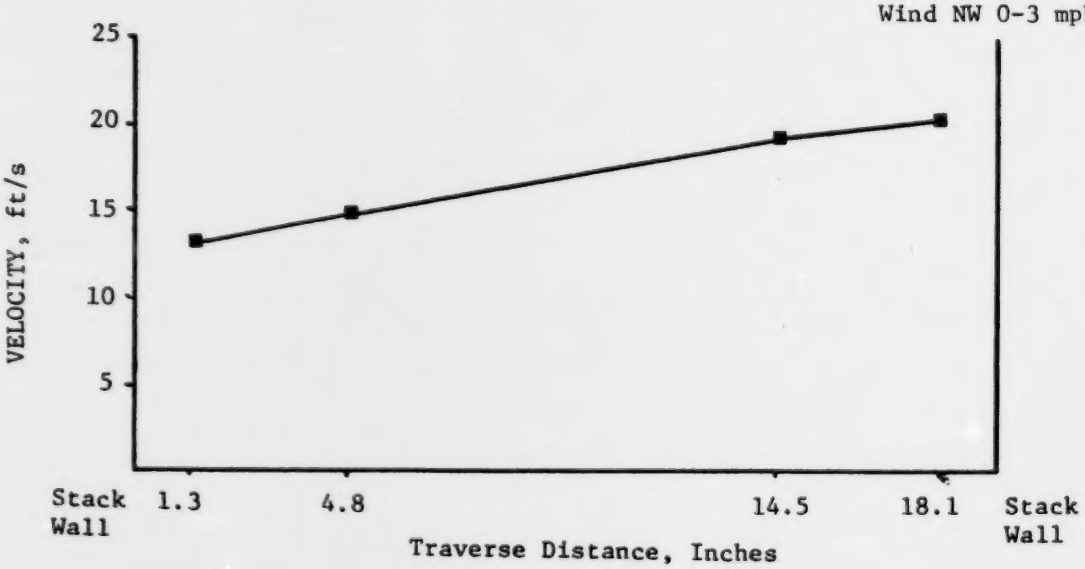
Graph 4. Velocity Profile of Test 2. Northeast Port.
Wind NW 3 mph.



Graph 5. Velocity Profile of Test 3. Northwest Port.
Wind NW 0-3 mph.



Graph 6. Velocity Profile of Test 3. Northeast Port.
Wind NW 0-3 mph.



APPENDIX C

FIELD DATA SHEET

Plant Garry Memorial Crematorium Location 1291 McGillivray Boulevard, Winnipeg, Manitoba

Stack East Crematory Test number 1 Date July 9, 1985

Ambient temperature (°F) 76 Barometric pressure (in. Hg) 29.22 Time 1:49 P.M. to 2:42 P.M.

Nozzle diameter (in.) 0.497 Probe length/type 5 foot/water cooled Stack static pressure (in. H_2O) +0.10

Probe temperature (°F) ave. 113 Filter holder temperature (°F) ave. 270 Leak check 0.000 CFM @ 15" Hg Vacuum

Traverse point number	Clock time, start	Stack gas temperature, °F	Gas meter volume, cu. ft.	Velocity pressure, in. H_2O	Orifice pressure drop in. H_2O	Gas meter temperature, °F Inlet	Gas meter temperature, °F Outlet	Final impinger Temperature, °F	Pump vacuum in. H_2O	Isokinetic factor, %
NW 1	0	1277	2.119	0.034	0.622	86	83	59	4	107.5
2	5	1356	2.290	0.041	0.721	98	83	56	4	107.2
3	10	1390	2.262	0.040	0.696	102	84	55	4	108.2
4	15	1422	2.280	0.041	0.696	104	84	55	4	107.9
NE 1	20	1299	1.770	0.024	0.433	92	88	66	3	106.9
2	25	1358	2.188	0.037	0.657	102	88	61	4	107.1
3	30	1402	2.555	0.050	0.864	107	88	60	5	108.3
4	35	1384	2.442	0.045	0.783	108	89	63	5	108.9
Average or total	40	1361	17.906	0.039	0.684	100	85	-	-	107.8

FIELD DATA SHEET

Plant Garry Memorial Crematorium Location 1291 McGillivray Bouldevard, Winnipeg, Manitoba.

Stack East Crematory Test number 2 Date July 10, 1985

Ambient temperature (°F) 68 Barometric pressure (in. Hg) 29.15 Time 10:05 A.M. to 10:56 A.M.

Nozzle diameter (in.) 0.497 Probe length/type 5 foot/water cooled Stack static pressure (in. H_2O) +0.10

Probe temperature (°F) ave. 121 Filter holder temperature (°F) ave. 272 Leak check 0.000 CFM @ 15 " Hg Vacuum

Traverse point number	Clock time, start	Stack gas temperature, °F	Gas meter volume, cu. ft.	Velocity pressure, in. H_2O	Orifice pressure drop in. H_2O	Gas meter temperature, °F		Final impinger Temperature, °F	Pump vacuum in. H_2O	Isokinetic factor, %
						Inlet	Outlet			
NW 1	0	1191	2.032	0.034	0.571	78	74	57	4	99.3
2	5	1253	2.171	0.040	0.648	87	74	56	4	99.0
3	10	1302	2.153	0.041	0.645	94	74	56	4	98.0
4	15	1350	2.205	0.043	0.663	97	76	57	4	98.6
NE 1	20	1194	1.571	0.021	0.354	86	80	62	3	96.6
2	25	1261	1.954	0.032	0.524	93	80	62	3	98.8
3	30	1304	2.037	0.035	0.557	98	80	63	3	99.5
4	35	1302	2.162	0.039	0.619	100	80	62	4	100.0
Average or total	40	1270	16.285	0.036	0.573	91	77	-	-	98.7

FIELD DATA SHEET

Plant Garry Memorial Crematorium Location 1291 McGillivary Boulevard, Winnipeg, Manitoba.

Stack East Crematory Test number 3 Date July 10, 1985

Ambient temperature (°F) 71 Barometric pressure (in. Hg) 29.16 Time 1:22 P.M. to 2:10 P.M.

Nozzle diameter (in.) 0.497 Probe length/type 5 foot/water cooled Stack static pressure (in. H_2O) +0.10

Probe temperature (°F) ave. 117 Filter holder temperature (°F) ave. 254 Leak check 0.000 CFM @ 15" Hg Vacuum

Traverse point number	Clock time, start	Stack gas temperature, °F	Gas meter volume, cu. ft.	Velocity pressure, in. H_2O	Orifice pressure drop in. H_2O	Gas meter temperature, °F Inlet	Gas meter temperature, °F Outlet	Final impinger Temperature, °F	Pump vacuum in. H_2O	Isokinetic factor, %
NW 1	0	1278	1.704	0.025	0.406	88	85	70	3	97.4
2	5	1342	2.150	0.040	0.630	93	84	64	3	98.5
3	10	1516	2.024	0.038	0.556	98	84	62	3	99.3
4	15	1310	1.861	0.030	0.481	101	84	65	3	97.1
NE 1	20	1190	1.558	0.020	0.340	94	86	70	2	96.7
2	25	1237	1.759	0.025	0.416	98	86	70	3	98.3
3	30	1311	1.879	0.030	0.477	103	86	68	3	97.7
4	35	1292	2.066	0.035	0.566	104	86	67	4	99.1
Average or total	40	1310	15.001	0.030	0.484	97	85	-	-	98.0

APPENDIX D

W.M. WARD TECHNICAL SERVICES LABORATORY CHEMICAL ANALYSIS FORM II

SUBMITTER: KEVIN REEVE
LOCATION: GARRY CREMATORIUM (TEST #1)
REPORT TO: KEVIN REEVE
ER-1

SAMPLE – ID
From: Y 85, Sequent 17900
To: Y 85, Sequent 17902

L – Less than
G – Greater than

Date Sampled: Y 85 M 07 D 05
Date Received: Y 85 M 07 D 11

Sample Number	Identification or Comments	Parameter	L/G	Value	Units	Date Analysed
17900	BOTTLE #1 - Probe washings and Glassware before Filter.	TSP		0.0382	g	85 07 17
17901	BOTTLE #2 - Impinger 1 and 2 Contents.	TSP		0.0081	g	85 07 17
17902	FILTER # 49	TSP		0.0385	g	85 07 17

Date 85-8-5

Chemist Signature

WM. WARD TECHNICAL SERVICES LABORATORY CHEMICAL ANALYSIS FORM II

SUBMITTER: KEVIN REEVE
LOCATION: GARRY CREMATORIUM (TEST # 2)
REPORT TO: KEVIN REEVE

ER-1

SAMPLE – 1D

From Y	From Sequent	To Y	To Sequent
85	17903	85	17905

L – Less than
G – Greater than

Date Sampled Y	M	D	Date Received Y	M	D
85	07	16	85	07	11

Sample Number	Identification or Comments	Parameter	L/G	Value	Units	Date Analysed
17903	BOTTLE # 1 – Probe washings + Glassware before Filter.	TSP		0.0335	g	850717
17904	BOTTLE # 2 – Impinger 1 and 2 contents.	TSP		0.0072	g	850717
17905	FILTER # 445	TSP		0.0145	g	850717

Chemist Signature [signature] Date 85 08 07

W.M. WARD TECHNICAL SERVICES LABORATORY CHEMICAL ANALYSIS FORM II

SUBMITTER: KEVIN REEVE
LOCATION: GARRY CREMATORIUM (TEST #3)
REPORT TO: KEVIN REEVE

ER-1

SAMPLE – 1D

From Y	From Sequent	To Y	To Sequent
85	17906	85	17908

Date Sampled Y	M	D	Date Received Y	M	D
85	07	10	85	07	11

L – Less than
G – Greater than

Sample Number	Identification or Comments	Parameter	L/G	Value	Units	Date Analysed
17906	BOTTLE #1 – probe washings & Glassware before Filter.	TSP		0.0438	g	850717
17907	BOTTLE #2 – Impinger 1 & 2 contents.	TSP		0.0065	g	850717
17908	FILTER # 450	TSP		0.0191	g	850717

Chemist Signature [signature] Date 850807